

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION SPECIFICATION
CS-43: "CONCRETE CANAL LINING"

43.1 SCOPE

This construction specification is applicable for the construction and installation of non-reinforced slip-formed concrete lined field ditches, canals, and laterals. The field ditches, canals, and laterals shall be constructed at the location and to the dimensions as shown on the plans.

43.2 SITE PREPARATION

The foundation area shall be cleared of vegetation, inorganic material and rocks with a dimension greater than 2 inches. The fill material shall be placed in horizontal layers with a maximum lift of 4 inches before compaction. The moisture content of the fill material shall be adequate so that a firm, dense foundation can be achieved. Fill sections with a height of 2 feet or greater will be constructed using the compaction requirements of Construction Specification CS-14 or CS-15 for Earth Fill. Other compaction methods approved by the technical representative may be used, if the fill sections are allowed, seasonal consolidation for at least a 6-month period.

43.3 MATERIALS

The materials required for this practice are detailed in Material Specifications, MS-201, Aggregate, MS-202, Portland Cement and MS-203, Concrete or as approved by the technical representative prior to placement.

43.4 CONSTRUCTION

a. Foundation:

The foundation surface for the concrete lining shall be moist when the concrete is placed. The concrete shall not be placed on mud, excessively dry soil, non-compacted fill, ice or frozen soil.

b. Placement:

Slip-forms shall be operated to achieve a uniform thickness of the concrete lining. The minimum thickness of the concrete shall be 2 inches.

c. Control and Construction Joints:

Control joints shall be 1/4" wide perpendicular of the concrete lining, at a depth equal to one-third of the lining thickness with a uniform spacing not to exceed 10 feet.

Construction joints shall be the butt type, formed square with the lining surface and at right angles to the ditch or canal. Control and construction joints shall have smooth finishes.

d. Curing:

The concrete shall be cured for not less than 5 days using one of the following methods:

1. Impounding water over the exposed surface.
2. Covering with burlap or a similar material that is kept continuously moist.
3. Spraying with a curing compound conforming to ASTM C-309, Liquid Membrane Forming Compounds for Curing Concrete. The curing compound shall be applied at a uniform rate of not less than one gallon per 150 square feet of surface area. It shall form a uniform, continuous, adherent film that will not check, crack, or peel. All surfaces shall be kept moist until the compound is applied.

e. Concreting in Cold Weather:

Provisions for placing concrete in cold weather shall apply when the average daily temperature is less than 40°F or when the maximum daily temperature is less than 50°F for 12 hours or less in a 24-hour period.

1. Concrete linings shall not be placed when the ground temperature is less than 40°F.
2. Prior to the placement of concrete all ice, snow and frost shall be completely removed from all surfaces to be in contact with the concrete.
3. The temperature of the concrete at the time of placement shall not be less than 50°F or more than 90°F. Heated water shall not exceed 140°F when cement is added to the mix.
4. The use of antifreeze or accelerator compounds is not allowed.
5. When the daily minimum ambient air temperature for the nearest weather station is predicted to be less than 40°F within a 3-day weather forecast, the concrete shall be insulated for 48 hours within 1 hour after placement using one of the following methods:
 - (a) Eight inches of straw covered with a polyethylene film.
 - (b) Two inches of sawdust or shavings covered with a polyethylene film.
 - (c) One-inch thick mineral fiber blanket.
6. In lieu of providing frost protection, the owner may proceed with the understanding that if the fresh concrete is unprotected and subjected to freezing temperatures

within 48 hours after placement and the concrete lining will not be accepted as meeting this specification.

43.5 DELIVERY TICKETS

The delivery tickets for the mix delivered to the site shall identify all ingredients by weight except water and admixtures that may be measured by volume.

Delivery Tickets for each load of Ready-Mix concrete shall be furnished to the technical representative.

43.6 ACCEPTANCE

The final acceptance of the work will be by inspection and to conformance to the requirements of this construction specification.